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ABSTRACT

The Writing to Read Program (WTR) objectives for 1988-89 included: to extend and support the implementation of the WTR program in New York City elementary schools; to promote the reading and writing achievement of kindergarten, first-, and second-grade students; and to introduce students in early childhood to computer technology. In 1988-89 the program served 87 schools in 22 community school districts. The methods used to evaluate the program included on-site interviews, lab and classroom observations, questionnaires distributed to all program participants and a selected group of parents, pre- and post-program writing samples, and reading achievement scores for the Metropolitan Achievement Test for both selected program participants and matching control groups. Overall reaction to the program was positive. Most participants believed that the program provided a good foundation in basic skills, helped to develop confident and mature writers, and that the computers and center setting were significant motivational devices. Some of the additional major findings included: (1) WTR program has little immediate impact, and no long-term impact on improving reading performance of participating students when compared with other reading programs; (2) students in the program made significant progress in their writing; (3) WTR students improved their writing skills to a greater degree than did similar students who did not participate in the program; and (4) monolingual students at the kindergarten level showed a statistically significant improvement in writing over bilingual kindergartners. (Eleven tables of data are included. One appendix includes the Writing Sample Scoring Scale.) (MG)

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EVALUATION SECTION REPORT

Writing to Read
1988-89

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EVALUATION SECTION
John Schoener, Chief Administrator
April 1990

EVALUATION SECTION REPORT

Writing to Read
1988-89

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THE WRITING TO READ PROGRAM
1988-89
EVALUATION SUMMARY

PROGRAM BACKGROUND

The Writing to Read Program (WTR) was organized by the New York City Board of Education's Division of Computer Information Services (DCIS) with the assistance of the International Business Machines Corporation (IBM) to provide a computer-based reading and writing program for children in kindergarten through grade two. The program's goal is to enable children to write what they say and to read what they can write. Under the guidelines of the program, students are to receive an hour of instruction daily in a center setting. At each school, the program includes a paraprofessional in charge of the center, and four or more classes who attend the center on a daily basis.

The program became operational in 19 schools during the winter of 1986-87. In the 1987-88 school year, the program was implemented in a total of 57 schools. During the 1988-89 school year, the WTR program was extended to an additional 30 schools, for a total of 87 schools in 22 community school districts. This represents a 34 percent increase in the target population from the previous year.

Funding for the program was derived from a variety of Chapter I and PCEN sources. For schools initiating the program in the 1988-89 year (known as Phase 4), the Chancellor's Office provided for electrification and security installations for labrooms and 50 percent of the matching funds, with districts providing the remaining 50 percent for hardware. Additionally, the districts assumed responsibility for providing space, furniture, and paraprofessional staff for the center. Those schools or districts in the second or subsequent years of participation also assumed responsibility for repair, maintenance, and supplies, including consumable items.

PROGRAM OBJECTIVES

During 1988-89, the stated program objectives were:

- to extend and support the implementation of the Writing to Read Program in the New York City elementary schools;
- to promote the reading and writing achievement of kindergarten, first-, and second-grade students; and,
- to introduce students in early childhood to computer technology.

PROGRAM EVALUATION

The methods used to evaluate the program included on-site interviews, lab and classroom observations by OREA staff, questionnaires distributed to all program participants and a selected group of parents, pre and post program writing samples, and reading achievement scores for the Metropolitan Achievement Test (MAT) for both selected program participants and matching control groups.

FINDINGS

Overall reaction to the program was positive. Most participants believed that the program provided a good foundation in basic skills, helped to develop confident and mature writers, and that the computers and center setting were significant motivational devices. The perception of the program is that it contributes to children's psychological and social development, and fosters attitudes of initiative, experimentation, and persistence that are essential to learning. Teachers who remain within the program for two or more years note significant changes in lab management, classroom instruction, and student-teacher interaction.

Successful strides were made in supporting and insuring the integration of WTR into the language arts curriculum both through staff development and district responsibility. Districts themselves have begun the task of integrating WTR with their other programs and enlisting various specialists in English as a Second Language, early childhood, language arts, and computer learning in the tasks of staff development and program integration. Plans to expand computer capabilities and to enlarge software libraries that promote language arts will contribute further in establishing continuity within the elementary school curriculum and expanding the language arts component within it.

Most paraprofessionals (84 percent) and a majority of the teachers (67 percent) in new programs found that staff development was valuable. In general, positive comments were based on in-school, district-, or TAC-based staff development that followed the IBM seminars. Conversely, teachers found IBM training presentations both too crammed and insufficient. For new teachers in old programs, the informal training provided was insufficient. Staff turnover and school policies that shift teachers experienced in the program to other (non-WTR) classes also contributes to limiting the benefits and outlay of training.

Additional major findings were:

- WTR program has little immediate impact, and impact one year after the program on improving reading performance of participating students when compared with other reading programs.

- Students in the program made significant progress in their writing. Pre- and posttest comparison of handwritten samples show gains that are both statistically significant and educationally meaningful.

- In a comparison of handwritten samples, WTR students improved their writing skills to a greater degree than similar students who did not participate in the program. Data show that more than one quarter of all WTR students in the program exceeded the control group in writing sentences and producing coherent narratives.

- Monolingual (English speaking) students at the kindergarten level showed a statistically significant improvement in writing over bilingual kindergartners participating in the program.

- The handwritten samples produced by students in the program represented significantly higher levels of writing than their computer-produced samples; however, the difference was not educationally meaningful.

- The program is addressing the impact on curriculum for kindergarten through grade two and beyond. Districts and schools are initiating training and acquiring hardware and software that will enable the provision of an integrated language arts curriculum that extensively promotes student reading and writing.

RECOMMENDATIONS

Based on these findings and other information presented in this report, the following specific recommendations are made:

- Develop evaluation guidelines for school and district level roles in program administration and development.

- Program administrators and district personnel should continue to insure the maintenance of adequate supplies and the expansion of available software, particularly in the areas of reading readiness, reinforcement, and materials appropriate for advanced level students.

- Continue to support the coordination of language arts curriculum development and WTR development activities.

- Encourage district and school supervisors in new programs

to provide preparation time for paraprofessionals and teachers to develop necessary supplementary materials, share experiences, and to orient themselves. First year participants also noted the significant benefits derived from the opportunities for interschool visitations established by some districts.

- Staff training should continue to emphasize developing positive interventions in the writing process to stimulate student creativity and reinforce phonetic instruction in the classroom to stimulate reading.

- Encourage schools to avoid shifting experienced teachers out of WTR to insure the stability and continuity of the program and promote long-term positive benefits that derive from program participation.

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I. INTRODUCTION

PROGRAM BACKGROUND

The Writing to Read program (WTR) was organized by the New York City Board of Education's Division of Computer Information Services (DCIS) with the assistance of the International Business Machines Corporation (IBM) to provide a computer-based reading and writing program for children in kindergarten through grade two. The program's goal is to enable children to write what they say and to read what they can write. Under the guidelines of the program, students are to receive an hour of instruction daily in a center setting. At each school, the program includes a paraprofessional in charge of the center, and four or more classes who attend the center on a daily basis.

The program became operational in 19 schools during the winter of 1986-87. In the 1987-88 school year, the program was implemented in a total of 57 schools. During the 1988-89 school year, the WTR program was extended to an additional 30 schools, for a total of 87 schools in 22 community school districts. This represents a 34 percent increase in the target population from the previous year.

Funding for the program was derived from a variety of Chapter I and P.C.E.N. sources. For schools initiating the program in the 1988-89 year (known as Phase 4), the Chancellor's Office provided for electrification and security installations for labrooms and 50 percent of the matching funds, with districts providing the remaining 50 percent for hardware. Additionally, the districts assumed responsibility for providing

space, furniture, and paraprofessional staff for the center. Those schools or districts in the second or subsequent years of participation also assumed responsibility for repair and maintenance of computer hardware and supplies, including consumable items (e.g., paper, workbooks, wordgames, computer diskettes).

The program and staff development activities are coordinated by the WTR unit within DCIS. The unit provided overall program support, coordinated new installations, and assisted with site program implementation. It also conducted up to three site observations of new programs. Staff development activities were provided by the WTR unit and IBM staff. IBM hosted an orientation for all new participating schools. The two one-day workshops were supplemented by two all-day workshops for paraprofessionals at district sites and three afternoon workshops for teachers at borough technical assistance centers (TACs). These supplementary workshops were also available to other interested staff and to teachers newly assigned to programs already in operation. In addition, DCIS supported a variety of ancillary courses on the writing process and classroom management that were relevant to the operation of the WTR program. Each participating district also received video tapes that participating individuals could use either to review or acquaint themselves with the philosophy and overall goals of the program, curriculum, and the roles of each staff member.

POPULATION SERVED

In 1988-89, WTR was implemented in a total of 87 schools within 22 districts, extending the program to six new districts. The 30 schools in their first year of operation gave priority to first graders, followed by second graders, in compliance with funding restrictions. New students in this program usually had pre-kindergarten experiences, but remained eligible for compensatory programs. All districts included populations at risk.

PROGRAM OBJECTIVES

During 1988-89, the stated program objectives were to:

- extend and support the implementation of the Writing to Read program in the New York City elementary schools;
- promote the reading and writing achievement of kindergarten, first, and second grade students; and
- introduce students in early childhood to computer technology.

PROGRAM EVALUATION

The purpose of the 1988-89 evaluation by the Office of Research, Evaluation, and Assessment/Instructional Support Evaluation Unit (OREA/I.S.E.U.) was to document the level and quality of program implementation and to assess the program's impact on student achievement in reading and writing. The evaluation pinpoints staff development activities and goals of the WTR unit, the increasing role of the districts, and the impact of the program on those who have been involved for two or more years. It highlights the relationship of the WTR program to communication arts curricula and computer instruction. These

aspects are also related to DCIS efforts to follow up on the recommendations of the report for 1987-88.

The following methods were used to evaluate the program:

- observations of center and classroom activities;
- interviews by OREA staff with the program manager and coordinator, as well as with selected district personnel at five districts, and principals, assistant principals, or program administrators, paraprofessionals, and teachers at 18 of the 87 operative schools;
- questionnaires distributed to the remaining nine district liaisons, and principals (program coordinators), teachers, and paraprofessionals of the other 69 schools, and to a random group of parents of participating students;
- comparisons of writing samples from selected program participants and a matching control group;
- analyses of 1989 reading achievement scores for second grade participants and analyses of reading achievement scores for a sample of last year's program participants; and
- attendance at selected staff development workshops and review of staff development materials.

SCOPE OF THIS REPORT

This report presents the results of the evaluation of the 1988-89 Writing to Read program. Project components and implementation are discussed in Chapter II. Chapter III encompasses reactions and perceptions of program staff and parents. Student outcomes are compiled and analyzed in Chapter IV. Chapter V contains conclusions and recommendations.

II. PROGRAM DESCRIPTION

PROGRAM COMPONENTS

WTR is a comprehensive multi-sensory, self-paced instructional program designed to help develop communication arts skills of early childhood students through their own writing. Students are initiated into the program through an orientation process. Under the rubric of "Vital Practices", the WTR manual describes the pedagogical strategies and management routines its developers consider optimal. These include bookkeeping, and activities designed to enhance the utilization of the program and to promote the student's personal and educational growth. Parental involvement is also considered essential to the success of the system. Staff development orients teachers and professionals to their roles, to the computer, and to the program as a whole.

Instructional Components

WTR is a highly structured laboratory program. The WTR center is divided into five stations: a computer-based instructional program; a work journal station, which uses audio cassettes and workbooks to reinforce and test for learning; a writing station, which includes dedicated word processors and tables at which students may write; a listening library, which permits students to "read" classics of children's literature while listening to the storytexts recorded on audio cassette tapes; and a "make words" station, consisting of

three-dimensional and tactile manipulative items used to reinforce phonemic learning. An optional book browsing section has also been established in some laboratories.

PROGRAM IMPLEMENTATION

Program Administration

Overall administrative responsibility of the WTR program was the provenance of the WTR unit within the Division of Computer Information Services (DCIS). The director and coordinator of WTR were responsible for selecting sites, insuring installation, and coordinating training, supervision, and evaluation. The unit acted as a liaison with IBM in contracting for equipment and training facilities, and with the state and federal agencies providing funding. Members of the WTR unit staff were available to answer questions and to provide staff development and acted as troubleshooters. An additional goal this year was to train district staff to assume increasing responsibility for and control of the program.

The Role of the District. With increasing numbers of schools establishing programs, major responsibility for supervision, staff development, and curricular integration began to be shifted from the WTR unit to the district. The districts had overall responsibility for funneling district funds into the program, helping to establish new WTR centers, facilitating technical assistance and repair, and offering staff development.

WTR liaisons within the districts had various titles and responsibilities in addition to their WTR program duties. They

included early childhood supervisors, reading coordinators, communication arts coordinators, and coordinators of funded programs, of special education staff development, and of proposal development; some were directors of computer operations while others were teacher trainers. There was little consistency among districts regarding WTR assignments, although the program usually, but not always, had some relationship to the liaison's other responsibilities. Two districts had liaisons who were responsible solely for the WTR program. In general the extent of the liaison's involvement hinged on district size, the scope of the liaison's other responsibilities, and the number of schools in the district involved in WTR, as well as the number of new programs being implemented this year.

All districts provided administrative supervision. Some of the districts included activities such as visiting classrooms to check on progress, troubleshooting, getting feedback from teachers, students, and paraprofessionals, ordering new and additional materials, arranging for released time for intervisitations, and communicating with the central WTR unit and with administrators. Approximately 50 percent of the districts restricted their role to administrative functions.

Those districts which went beyond administrative functions devoted themselves to staff development. Some liaisons took responsibility for training language arts staff developers for on-site training or for providing on-site workshops themselves.

Within this arena, liaisons first gave priority to new sites and then to new teachers at old sites. Many liaisons took steps to acquaint other district personnel with WTR and to ensure the increasing involvement of early childhood and language arts personnel. Where language arts cluster teachers or communication arts specialists existed within the school, these staff members sometimes also took responsibility for on-site program coordination and staff development, especially for new teachers and paraprofessionals within already existing programs.

This year was a transition period as district personnel and communication arts specialists mastered the program, took initial steps to coordinate it with other district units, and to clarify the district's role and developed guidelines for the schools.

Staff Development and Support

This year's staff development stressed the instructional responsibilities of the teacher. Its three major goals were to provide training in (1)program management; (2)the writing process; and (3) the integration of the program into the curriculum.

This last goal was a new one, consistent with recommendations in the evaluation for 1987-88. The indirect objective of staff development was to train district personnel to assume this function as WTR is extended in their districts.

In conjunction with these goals, the introductory IBM seminars separated administrative from educational issues. Held on

staff development days, the seminars focused on the roles of the paraprofessional and the teacher, the writing process, and extending WTR into the classroom. Paraprofessionals were given additional technical training.

Up to three follow-up visits (to each new program) were intended to promote the goals established with the initial training. All site observations were planned with the district liaisons, who could then learn from the WTR unit and contribute to the staff development process. The first observation focused on program management, the second on the use of the writing process, and the third on the effective integration into the curriculum by observing and discussing in-classroom activities. Meetings with individual liaisons held after observational visits insured follow-up to remedy program deficiencies.

WTR unit staff generally participated in or ran the staff development workshops at the beginning of the year. One district used the workshops to motivate teachers to register for a variety of courses offered by the Technical Assistance Centers; another district used the workshop to lay the foundation for further on-site training provided by district personnel. On-site staff development stressed management strategies, writing process techniques, and the establishment of WTR-like centers in the classroom as a structural preliminary to curricular integration.

A conference held with the liaisons in early June 1989 evaluated staff development and revised training for 1989-1990

accordingly. The conference also focussed on new software and programs available for use with the WTR program, new sites, problems and issues, and the roles of the principal and liaison.

In the survey of all program participants, thirty-five percent (N=20) of the administrators indicated that in-house workshops and staff meetings had been geared to reinforcing the program and promoting changes in curriculum and instruction. Two administrators indicated that WTR goals were part of the overall attention given to improving students' reading or to the curricular goals established within the school. Another respondent indicated that the participating staff were encouraged to become computer literate. Another third of the respondents indicated that staff development had been provided by the WTR unit or off-site programs. Slightly less than a final third indicated no staff development for administrators was provided. Among teachers, 30 percent indicated that they had received in-school training, while others indicated that they had attended training at another school (24 percent), the district office (3 percent), or TAC (33 percent). About 10 percent received no training at all; in interviews, teachers who had not participated in any staff development indicated that they had read the WTR manual, consulted with other teachers, and received guidance from paraprofessionals managing the WTR center.

WTR Center Implementation

Generally, programs began on time. Respondents indicated

that 69 percent of all programs were initiated in September or October, and an additional 12 percent began their programs by November 1989. Among first-year participants, the rate was somewhat higher in regard to timely initiation: 72 percent began in September and October, while an additional 18 percent were under way by November. Overall, approximately 8 percent indicated that classes spend 40 minutes or less per session, 44 percent are in the WTR center for forty-five minutes, while 28 percent are there for more than forty-five minutes. In schools initiating their programs in 1989, 63 percent of the classes attend sessions for forty-five minutes, while 28 percent attend for more than forty-five minutes. Over 90 percent of all classes attend sessions five times a week, and in virtually all cases, the entire class attends at once. In about five percent of the cases, teachers do not attend with their classes.

Difficulties which participants experienced involved delays in the receipt of materials or disruptions resulting from broken or damaged machinery, defective or mismatched materials, or room repairs and renovations. These problems affected approximately one sixth of the programs. Another related concern was the lack of technical expertise on-site, which exacerbated minor problems.

Other obstacles variously cited by district and administrative personnel, teachers, and paraprofessionals affecting implementation, included teacher resistance and lack of training for newly assigned teachers to existing programs, frequent staff

changes, inadequate communication among participating staff and between districts and schools, lack of district advocacy, lack of administrative support, and lack of knowledge and standards for program support and implementation. A number of people cited the lack of adequate training, especially for new staff, and its related impact on integration into the curriculum.

Classroom/Curricular Integration

In general, teachers moved toward combining reading and writing and saw the relationship posited by the program as one underlying other programs such as the language experience or whole language approach with which they have had experience. Thus some teachers (N=17) noted that WTR reinforced--rather than changed--approaches and methods that they were already using in class.

Classroom activities used to affect integration included: coordinating phonics with the order of presentation of phonemes in WTR cycles of instruction and practicing these in the classroom; systematically comparing English and Spanish phonemes (for limited English-speaking and English as a Second Language students) using phonemic spelling; using WTR phonemes to help children sound out words they are reading; using WTR words in ESL, spelling, penmanship, and vocabulary lessons; reading stories aloud and asking children to write new words or details they have learned; and, using class trips and other classroom projects, texts, discussions, and artwork as the basis for story-writing. One teacher noted that she devoted at least 15

minutes in class to prepare student before each WTR lesson, while several others (N=8) indicated they devoted a similar amount of time for follow-up.

Teachers also noted the use of various aspects of the writing process, including a variety of pre-writing activities to stimulate student writing. Composing activities, such as having students complete and read their writing aloud in class, questioning them for further details or on other matters related to their writing were used to encourage revision and development. Teachers also "published" student writing in class or in individual "books", as well as on classroom bulletin boards that integrated various curricular areas. Some districts encouraged teachers to post a variety of topics that children could use for their writing. One school installed suggestion and complaint boxes for the children. In another case, a teacher provided group writing experiences in which the entire class collaborated in writing a story. While most teachers indicate that they give children more writing, a few indicate that WTR insures that children will have had at least one opportunity to write that day. In one or two districts, the WTR program has replaced the use of phonics materials and workbooks.

In addition to curricular integration per se, various schools have encouraged teachers to establish writing or communication arts centers; a number of teachers have included make words materials as well as listening libraries in these centers. These stations create opportunities for in-class

writing and reading on an individualized or small-group basis.

The degree of classroom curricular integration increases with the number of years the teacher has been involved with the program. Large-scale integration of writing into the curriculum or coordination between other forms of language arts instruction was noted by a few administrators and teaching specialists. In one case, where the program was restricted to kindergarten students, teachers at the first-grade level were encouraged to prepare for students who were more self-motivated to write and at a more advanced level of writing skill than previous first-graders. At another school, the second-grade curriculum incorporated a creative writing component intended to reinforce the grade one WTR curriculum. In some cases, the communication arts cluster teacher worked with grades two and three to reinforce writing and reading instruction, using strategies similar to those used in the WTR program, while ESL specialists used similar methods to insure the coordination of phonics instruction for limited English proficient students. One school indicated that it had planned a series of end-of-year workshops to determine the impact of the program (restricted to kindergarten and grade one children) on the grade two curriculum.

Computer Integration. Since WTR uses computers as a teaching tool and uses word processors as a tool for writing as well as having computer literacy as one of its objectives, the evaluation sought to assess computer capabilities in the schools

and to determine the degree to which the goals of the program were integrated with other computer instruction. School administrators indicated that there are at least some other computers in the school. Approximately a third of the participating schools have fewer than 16 computers, while two-thirds have up to 30 computers. In most cases, there is one computer lab in addition to the WTR center, servicing the upper grades, a few classes equipped with one to three computers used with children in special education programs, and/or a few computers functioning in the library. The lab is usually used for enrichment and remediation, and for computer literacy and word processing (understood as a computer tool). Some additional computer labs are devoted to reading. While a small number of schools indicate having a computer cluster teacher, the majority of respondents suggest that they do not have the specialists to support curricular integration. The general conclusion is that students who have participated in the WTR program in kindergarten and grade one have no opportunity to work at computers until grade 3, and limited opportunities to use computers for writing thereafter. Thus, it is suggested that the state increase its funding so computer hardware and software be widely available for grade two students.

CHANGES IN IMPLEMENTATION

Of those schools that had been in the program three years or more, 41 percent of the teacher respondents indicated that they had participated for two or more years. Among

paraprofessionals, 58 percent had managed the WTR centers for two or more years. Two-thirds of the paraprofessionals and one-fourth of the teachers report that they made no changes or that none were needed. Changes that had occurred as a result of experience with or involvement in the program may be categorized as those affecting WTR lab management, classroom structure and instruction, and interaction among staff and teachers and students.

WTR Center Management

The most significant overall change in management is the abridgement or revision of bookkeeping procedures. Many teachers (40 percent) find the individual WTR charts both inadequate and time-consuming. High absentee rates also contribute to amending labroom assignment procedures. Among paraprofessionals, the greatest changes (15 percent) they have made have been to lengthen the orientation for both students and teachers, and to increase contact with teachers.

Teachers and paraprofessionals report rearrangements in stations or student patterns of flow, either to increase fluidity from station to station or to eliminate potential safety hazards. Many teachers reported managing the shifts from station to station with greater facility and ease. Paraprofessionals rearranged labs so that cycle words were adjacent to computer stations and the alphabet was placed near or at the writing station. A number of the staff added color-coding or numbering to stations and used these codes to

simplify student station assignments. Another center designed and introduced instruction posters for the keyboard station to provide greater independence for the children working there.

Teachers have made various adaptions of station requirements. One teacher reported having students working at only one station in a given period; another indicated that students only worked at three stations rather than the five recommended. One teacher indicated that she was able to maintain greater discipline by having the students complete their full time at a particular center; the trend among more experienced teachers seemed to be in the opposite direction. That is, many said they provided greater flexibility--permitting students who need or want to to remain at specific stations to complete their activity. In conjunction with this, students were granted greater independence to move freely from one station to another when they had completed their assignments. Teachers also noted more flexibility in pairing students, "to accommodate (excessive) absences, interest level, and the developmental progress of the children."

Experienced teachers and paraprofessionals also indicated that they had increased the quantity of materials in the make words and listening library stations; they now understood the function of these stations better and exploited them more effectively than they had initially. They also scrutinized the work the students do at these stations more carefully than they had previously, and more is done to prepare children for the

program or to supplement work journals with other workbook practice when analysis shows a child is not ready for phonemic work or has not mastered particular phonemes. Paraprofessionals, too, comment that they worked more closely or in a more orderly and systematic fashion with students. In sum, as one teacher put it, there was a "greater emphasis on WTR as a learning experience rather than a playtime experience."

The most substantive revision reported had to do with the focus on writing in the WTR center. Several teachers (35 percent) commented that they have concentrated on writing as the central activity of the program, with a longer period of time at the writing station for the individual student. Teachers have increasingly moved away from having children engage in copying exercises and have moved toward promoting original student writing. Motivational activities and strategies included: providing various colors and kinds of papers as well pictures, posters, and story starters; the use of personal diaries and "task cards" intended to expand the students' vocabulary; and book reports and other theme-related topics for writing for more capable children. At the same time, teachers also report giving their students greater freedom at the writing station.

Classroom Structure and Instruction

Most teachers noted that they had established communication arts stations, make words stations, and other similar formats in their classrooms, paralleling the stations in the WTR center; in cases where these had already been established, the teachers

considered that they were now "in full force." Others noted that they posted WTR cycle words in the classroom and used them in a variety of ways. Many noted that they used WTR phonics in the teaching of spelling and reading. Finally, others indicated that they had expanded their in-class writing programs. In some cases, teachers began writing activities earlier in the year than they have done previously because the students seem more prepared to respond to such activity; other teachers mentioned that writing activities were now more open-ended and creative. Teachers more experienced in the program (as compared to teachers new to the program) tend to spend more time in "pre-writing" activities that stimulate student writing, such as: discussing trips, assembly programs, family outings, and special holidays; using cycle words as a writing focus; using stories in the basal reading program as the basis for the student's own writing.

The other noteworthy changes involved preparing students in advance for their work in the WTR center and extending the centerwork into the classroom after lab attendance, by having students complete writing in class or share their work by reading what they had written to each other, to the entire class, or to the teacher individually. In general, these changes indicate a greater integration of the WTR with the language arts curriculum, as described earlier in this chapter. They also reflect a more extensive structuring of classroom routine and strengthening of classroom management to insure that the teacher

accomplishes the goals she has set. However, it should be noted, that in some cases, more extensive class time devoted to various communication arts and writing activities is intended to compensate for diminished time in the lab, when the period has been shortened from the recommended hour to forty-five minutes or less.

Finally, teachers noted changes in teaching style that resulted from their participation in the program or that were reinforced and sanctioned by it. As one teacher commented: "WTR has taught me to break up lessons into shorter segments and to provide learning that includes movement (such as dance or other physically-based exercises)." In other words, WTR has changed not only what skills are emphasized, but how basic skills are taught; WTR also affects in what ways participants teach.

Student and Staff Interaction

As a result of their involvement with the program, teachers enjoyed and encouraged more frequent small-group and one-to-one interaction as well as student collaboration and peer teaching. These methods responded to and created possibilities for greater independence. Teachers give students more freedom to work individually or engage in independent activity either during certain times of the day, or once they have completed a particular assignment. Teachers also noted that students express their thoughts and seek help more readily under this more flexible structure.

PARENTAL INVOLVEMENT

The WTR Program considers parental involvement to be an integral aspect of the program; the manual provides a discussion regarding parental orientation to the program. The program also includes consumable material that the children take home with them to show their caretakers.

Most administrators (88 percent) discussed the program at parent-teacher meetings held at the beginning of the school year. Two-thirds indicated that they also held a WTR "Open House," for parents to observe the program in operation, while a small number of schools (9 percent) offered an after-school program in the center. Almost all programs (92 percent) relied on notices and curricular materials sent home with the child and on parent-teacher conferences to inform parents.

Teachers confirmed their critical role in informing and involving parents through individual notes, comments on the child's progress at the end of each cycle, explanations and praise of the program, encouragement to visit the center, and suggestions for after-school activities for parents and their children.

A few schools have parent activists who participate as volunteers in the WTR center; in one school parents have officially urged an extension of the program to upper grades. Parental involvement on an individual basis varies from class to class and school to school, and does not necessarily seem to be related to administrative and teacher efforts. That is, in some

cases, extensive efforts to involve parents resulted in only limited observable success.

Parental responses (as gleaned from teacher, administrative, and parental surveys) included: comments on their children's positive attitude toward, and progress in, the program or their writing; questions and concerns about the phonemic spelling; reinforcement work with students on phonemes in the work journal; encouraging their children to write more at home; purchase of home computers; the use of positive reinforcement of reading and writing activities done at home; and, in one school, providing additional equipment for the center. Caretaker respondents also noted that older children or adults read to their child (59 percent), that the child had crayons and other writing materials available at home (90 percent), that the child received books as presents (75 percent) and that other books were present in the house (91 percent), and that the child had a place to read or write in the home (79 percent).

III. REACTIONS AND PERCEPTIONS

METHODOLOGY

To determine staff reactions to and perceptions of the WTR program, teachers, paraprofessionals, assistant principals and principals at 18 schools and liaisons from five districts were interviewed. In addition, quantitative data were accumulated by distributing questionnaires to all WTR participants and district liaisons. Questionnaires were distributed to all participating paraprofessionals, teachers, assistant principals, principals and/or in-school program coordinators within this subset. Brief surveys were also distributed to a small number of parent-caretakers whose children were participating in the program within these schools. In total, the report is based on responses from 68 percent of all administrators and teachers, and 72 percent of all paraprofessionals participating in the program. The report also discusses the findings from 130 parent/caretaker respondents.

REACTIONS AND PERCEPTIONS

Classroom/Curricular Integration

Two-thirds of the administrators indicated that WTR has had a moderate to great impact on curriculum and instruction. Proportionately, a greater number of district personnel (N=11) believed the impact was more extensive, although they believed it varied from site to site, varying with the motivation of the teachers and degree of administrative support. Eighty percent

of all teachers indicate that they integrated WTR into their curriculum to a moderate or great extent. For those who did so, they considered WTR to be a supplement to the communication arts curriculum, and generally used the program either to introduce material that is later developed more extensively in the classroom or to reinforce learning initiated in the classroom.

Student-Teacher Interaction

As previously indicated, the nature and extent of student-teacher interaction changes with the number of years of the teacher's involvement in the program. This trend reflects the attitudinal changes on the part of both teachers and students as the perceived result of participation in the program. It is this attitudinal change that is most perceptible in talking with teachers and in their responses to questionnaires. Teachers express a change in their positive expectations of the children, with regard to the children's ability to learn (especially kindergartners), their actual productivity, and their capacity to assume responsibility. One teacher remarked: "I've learned how complex first-grade students' thoughts are, and that no matter how young, each student has his or her own philosophy."

Teachers also noted that attitudinal changes in themselves produced changes in teaching style that included: the ability to vary strategies for alphabet teaching and the teaching of writing, the ability to work in a more complicated but relaxed atmosphere, a diminished concern with "correctness" and an ability to tolerate a greater degree of "error"; and a

concomitantly greater interest in what their students have to say and write.

In sum, the WTR program contributes to attitudes that promote the growth and development of the child's autonomy, greater flexibility on the part of the teacher, and which foster more positive student and staff interactions.

Paraprofessional-Teacher Relations

An overwhelming majority of both paraprofessionals (86 percent) and teachers (91 percent) consider relations between the two to be moderately to extremely positive. However, it should be noted that a small minority of paraprofessionals (14 percent) consider relations to be moderately poor. This perception may be accounted for by the paraprofessionals' relatively subordinate position and a perception that they lack authority to make needed changes or deal with problems arising in the center. A smaller percentage of teachers (8 percent) expressed criticism of the paraprofessional, usually with regard to preparedness and ability to work with children.

The factors that seem to make for the greatest success, as indicated by interviews, are: (1) the degree of flexibility among the staff, which permits a certain deviation from strict role definitions for the lab personnel; (2) active teacher participation in the center; (3) the degree to which both teacher and paraprofessional consider that the other contributes to the creation of a learning environment in the center; (4) adequate supervision and frequent communication among all staff

members; and (5) the degree to which the paraprofessional promotes independence in the students in the center, by allowing for increased opportunities for the children to manipulate the materials and programs themselves. In general, these factors also presuppose lab personnel who have either had experience working with children or some academic background in early childhood as well as sufficient computer competence to keep the WTR center functioning smoothly.

Parental Support

As previously indicated, many schools and teachers made efforts to involve parents in the program. Generally, WTR staff showed a significant awareness of the importance of parental support. Some few teachers indicated that they were unsure about or unaware that parental involvement was an aspect of the program, while some others indicated that they were too busy or too new to the program to initiate parental involvement (districts 6, 19, 23). A few administrators and teachers who sought to involve parents and failed believed that a lack of knowledge about the program's aims and methods meant a confusion about and hostility to the program; in one school a parent had withdrawn her child from the program.

A large minority of teachers (44 percent) believed their efforts and the program had had significant impact on parental behavior. Teachers indicated that anywhere from 25 to 50 percent of the caretakers responded with interest, curiosity, and willingness to provide reinforcement at home. While a few

parental responses indicated that parents considered the program a waste of money, the overwhelming majority of knowledgeable caretakers (95 percent) like the program.

Student Benefits

All staff members and parents perceived a variety of social, personal, and academic benefits for the children in the program. Approximately one third of the teachers consider the program to have had a significant impact on attendance.

Attitudinal Changes. Amongst teachers, 84 percent believed their students' response to the program ranged from positive to extremely positive, while 60 percent of the paraprofessionals considered the program had a great impact on student motivation, and an additional 35 percent indicated that the program's impact on student motivation is moderate. Ninety-six percent of the parent/caretakers also indicated that their children liked the program.

The degree to which teachers and other staff notice and affirm attitudinal changes among their students cannot be over-emphasized. Teachers perceived a greater willingness on the part of students to express themselves and to ask for help when necessary. They were also impressed by the extent to which students took the initiative in writing, and the degree to which students wanted to read and share their writing with them and with other students. Some also noted the degree to which positive self-esteem carries over into other areas and makes children more willing "to meet the challenge of new knowledge."

Administrators concur that program students' confidence and self-esteem increased and these gains promote enthusiasm, self-motivation, and more experimental attitudes, all of which contribute to learning. They also believe that the program contributes to cooperation and teamwork among the children, and that the structured program and its routine are helpful to the students' acquisition of the discipline necessary for learning.

Academic Progress. Most respondents (teachers=75 percent; administrators=58 percent) stress the extremely positive impact of the program on writing, noting benefits in the program's reinforcement of phonics and spelling. One teacher remarked that students are able to "put thought processes on paper." Other teachers and administrators noted that the "maturity" of student writing was noteworthy. There were also impressed by the length and development of the students' work. Most teachers indicated that students develop skills earlier than their past experience would lead them to believe was possible.

Program participants also noted the advantages for particular groups of students. Noting the program's use of the visual modality, teachers indicated that it aided those with poor auditory discrimination and enhanced students' hand-eye coordination. Many factors, including the program's repetitive and non-judgmental quality, increased its value to slower students (in grade two), and bilingual or limited English proficient students. ESL teachers also suggested that the

program's stress on phonics was beneficial for their students, especially those who were more advanced bilingual speakers.

While some kindergarten teachers express reservations about the program benefits for their students, those who experience the greatest success point to the importance of developing extensive reading readiness before attending the WTR center, or incorporating reading readiness software programs and activities into the WTR center prior to embarking on the program itself.

Perceived gains in the academic arena were noted by caretakers. A third of the parents, asked to compare their children's progress in reading and writing to that of older children in the household, said the children participating in the program were reading and writing better than their older children, while another 13 percent indicated that the children were performing at least as well as their older siblings had. Parents indicated that they had seen proof of their children's reading and writing ability. Over 80 percent noted that their child read signs, labels, books, or other materials; three-quarters of the children were also motivated to read on their own. More than half of the students also shared their school work with the family. Regarding writing, 51 percent of the parents had seen their children writing words and stories.

In general, professional staff commented somewhat less on the program's effect on reading achievement, with 20 percent of the teachers and a third of the administrators questioning its effectiveness in this area. Interviews with administrators and

teachers, however, suggest that the program's reinforcement of phonemes is a helpful base for reading progress and that the students, because of their greater self-confidence and more experimental attitude, are more willing to attack words that they do not know.

Students made clear gains in computer literacy. Ninety percent of the paraprofessionals believe the program to be moderately to extremely effective in teaching the students to use the computer. A number of professionals noted the ease with which the children use the computer and the manner in which the computer facilitates their writing. Many teachers and administrators note the benefit of access to computers and beginning computer literacy.

Staff Development

Most paraprofessionals (84 percent) and a majority of the teachers in new programs (67 percent) found that the training was valuable, especially in providing a general overview. As is usually the case, teachers most appreciated practical applications and opportunities: visiting a site, watching children at work in a lab, and speaking with principals, paraprofessionals, and teachers already participating in the program and on-site exchanges with WTR staff developers. They found brain-storming, problem-sharing sessions, and receiving practical information most beneficial. Teachers stressed the helpfulness of knowledge provided for center management and classroom organization, writing process activities, strategies for using the stations, and

learning how to make educational materials. Paraprofessionals felt they benefited most from making games, computer training, and trouble-shooting discussions, as well as from the opportunities to exchange ideas with fellow staff members. In general, the positive comments are based on in-school, district-, or WTR unit staff development workshops that followed the IBM seminars.

Conversely, teachers found IBM training sessions least useful. Specifically, they found the presentations both too crammed and insufficient. Above all, they objected to the lecture format and the use of videos in "an isolated environment" in lieu of interactive discussion and hands-on processes. Comments indicate that the discussion on writing stages and language arts was considered too general and basic; teachers also considered that the training gave too little emphasis to orienting students, the use of manipulatives, and the function of the make words station. Some staff expressed the opinion that it might have been helpful to make clear the motivation for emphasizing the writing process, rather than each of the stations, their functions, and materials in preliminary follow-up workshops. For new teachers in old programs, the informal training (videos, paraprofessional guidance, sometimes site visits) was insufficient, especially if day-to-day supervision was lacking, and administrative or district support were minimal.

Suggestions and Future Plans

Different levels of participants expressed varied concerns regarding program implementation, writing and curriculum integration, materials, and optimal target populations. They also discussed anticipated changes for the following year.

In districts, plans were being made to strengthen WTR supervision through the appointment of full-time staff persons. Districts also hoped to coordinate the program at the policy and implementation levels, working more closely with early childhood professionals and Project Child Coordinators. Greater involvement of reading coordinators (Chapter I/P.C.E.N.) and specialists as well as communication arts specialists, along with the movement towards a whole-language approach in some districts, is seen as critical in insuring on-site training and improved integration of WTR into the curriculum. Several district personnel discussed plans for expanded or continued training of teachers to work with children in small groups or cooperative learning situations, in the writing process, and in lab and classroom management. One district emphasized the need for providing continuing staff support for grade one WTR teachers, others for extending support to receiving grades-two-and-three teachers, both through training and classroom restructuring. Program support is also evident in plans for assessing and purchasing software and other supplementary materials recommended by the WTR unit, and plans for better communication among teachers, especially at the beginning of the

year.

Both district- and school-level administrators expressed the need to clarify the responsibilities of district, administrative, and communication arts school staff through the establishment of standards for program evaluation and accountability. Both groups hoped to increase supervisory training and school-district communication. Many administrators were also seeking ways to expand their computer facilities and instruction (73 percent), either through the installation of new computer labs or the hiring of computer specialists/cluster teachers. A number of administrators planned to add new software and increase the use of computers for reading readiness, creative writing, and other writing projects. Some administrators hoped to extend the program to kindergarten or grade two classes (especially for bilingual children and non-readers), in situations in which these had not been part of the original target population and where the funding source permits.

District staff and administrators also noted hardware concerns. Some called for printer networking so that children can easily print out stories, and at least one double-disk drive in each lab so that disks can be backed up quickly as part of the installation package. Noting the lack of user-friendly programs and the difficulties in obtaining replacements for destroyed or defective modules, others made recommendations regarding the improved retrieval of word processor files and site licenses for

copying programs. Some administrators indicated that better quality and a greater quantity of headphones might also be included in the initial hardware package.

Administrators and teachers both expressed concern regarding training. If district personnel perceive that teachers are not as motivated or involved in lab operations, administrative staff and teachers perceive that teachers have not been given sufficient on-site training to make them comfortable taking the initiative in the WTR center or integrating the program into their curriculum. They requested a clarification or improved guidelines regarding the roles of paraprofessionals and teaching staff in the labroom.

Teachers frequently requested more basic supplies and worn-tape replacements and also focused on the need for additional materials within stations, readiness materials preceding the first cycle, materials reinforcing the program's ten cycles or extending beyond them. Finally, a number of teachers urged increased administrative support for parental involvement, including special parent workshops to be held in the WTR center, evening hours to draw working parents, and PTA involvement.

IV. STUDENT OUTCOMES

METHODOLOGY

The effect of the WTR program on student achievement was determined by examining the change in participating students' writing performance between 1988 and 1989, and on the reading achievement of second grade students. Long-term program effect on achievement was measured by examining the reading achievement of a subset of students who were not now in the program but who had participated in 1987-1988. To determine reading achievement, data were analyzed only for the subset of WTR program participants with citywide standardized reading test scores. In addition, the same information was collected for control (Non-WTR) groups which were matched to target (WTR) groups by grade and linguistic status. To determine writing achievement, pre and post writing tests were administered to target and control groups during the school year. Note that the districts assumed responsibility for matching control and target groups for the writing tests based on grade and linguistic status of comparable student groups.

Reading

Program effect on students' reading achievement was measured by analyzing achievement differences between WTR students and a matched group of students not participating in the WTR program. Since standardized reading test scores were available only for grade two students in the 1988-89 school

year, kindergarten and grade one students were excluded from the analyses of reading achievement. To measure the long-term impact of the WTR curriculum on students' reading achievement, 1989 reading scores of grade one students from last year's WTR program (who were no longer in the program during the 1988-89 school year) were compared to a matched sample of students who never participated in the WTR program.

For the analyses of both immediate and long-term impact of the WTR program on students' reading achievement, test scores obtained from the spring 1989 Metropolitan Achievement Test (MAT) were used.

Analyses. Analyses of students' reading achievement were performed on students' normal curve equivalent (N.C.E.s) scores. Reading improvement was operationally defined as statistically significant higher mean reading scores for WTR students than for non-WTR students. Independent t-tests were used to determine whether the mean reading test scores of WTR students were significantly different from those achieved by non-WTR students.

A statistically significant difference indicates whether the difference in achievement is real or occurs by chance. However, statistical significance can be exaggerated by a large sample size or depressed by a small sample size. Furthermore, statistical significance does not address the issue of whether the differences in achievement are important to the students' educational development. Thus, an effect size (E.S.) is reported for each statistically significant difference, to

indicate the educational meaningfulness of each difference, independent of sample size. An E.S. below 0.2 is considered small, 0.5 is considered moderate while an E.S. of 0.8 or above is considered to be educationally meaningful.

Writing

To assess writing achievement for students participating in WTR, two types of writing samples were collected. As pretest in fall 1988, and again as posttest in spring 1989, handwritten samples were collected. Writing samples produced on the word processor in the spring 1989 by WTR students were also collected. Students in the control groups completed only handwritten pre- and posttests.

The writing assessment and scoring was adapted from the Educational Testing Service (ETS) Evaluation Model. For scoring, a six-point scale was used to provide an overall rating for each sample. The scale uses a "character trait" model, assigning specific characteristics to each point.* In addition to the six points, OREA added "0" to describe samples that consisted only of the child's name or random letters and "8" was assigned to those who were present but produced no writing. Students who were absent were excluded from the sample. A "7" indicates that students produced writing in a language other than English. The scoring was done by an evaluation team. Each sample required two independent readings; the second reading was a blind

*This is in contrast to a holistic evaluation model. The original IBM evaluation misapplies the term to its writing analyses.

reading, one in which the reader did not know the first score given. In cases of non-agreement between the first and second readings, a third rater made the final determination. Inter-rater reliability was obtained for eight pairs of readers, the reliability coefficient (alpha) ranged from 0.71 to 0.99 with an average of .91. This represents an acceptable inter-rater reliability.

One problem in the methodology was the limitation of the Educational Testing Service Model, or of any diagnostic model--when applied to comparison groups or more generally, when used to assess achievement. Stages 1 and 2 (cycle words vs. "new" words, see Appendix A for a definition of different stages) are easily distinguished for the target group but the distinction has no relevance for the control group. Students not participating in the WTR program do not have "cycle" words, although they may have a comparable lexicon or "sight vocabulary," derived either from phonemic-based or basal texts and language experience curricula. Thus, those assessed as having reached stages 2 or 3 in the control group may, in fact, only have achieved stages 1 and 2 respectively.

Analyses. A single overall rating was produced for each sample. Frequency distributions of the stages of the writing samples were generated for kindergarten, first- and second-grade students for both WTR and non-WTR groups. T-tests were performed to compare mean differences between pre and posttest and between handwritten and word processed samples within the

WTR group. Effect sizes (E.S.) were also computed for each t-test comparison.

Analyses of covariance (ANCOVA) were also performed to determine whether there were significant writing achievement differences between WTR and non-WTR groups and between monolingual (English) and bilingual WTR participants. These comparisons were made on posttest scores while holding their pre-test scores constant. An effect size (eta^2) is reported for each statistically significant difference to determine its educational meaningfulness. An eta^2 below 0.01 is considered a small effect size, 0.06 is considered a moderate effect size, while an eta^2 of 0.14 or above is considered to be a large effect size.

RESULTS IN READING ACHIEVEMENT

Tables 1 and 2 focus on the comparison of reading performance between WTR and non-WTR students. Table 1 presents the group comparison for grade two students in the 1988-89 school year. The N.C.E. scores for those in grade two show that WTR students read slightly better than non-WTR students, although the difference is neither statistically significant nor educationally meaningful. Table 2 presents the analysis of the long-term impact of the 1987-88 WTR program on students who are now second graders in the 1988-89 school year. Former WTR student scored slightly lower on the MAT test this year than non-WTR students but this difference is also neither statistically significant nor educationally meaningful. In sum,

TABLE 1

Comparison of Groups on 1989 MAT Reading
N.C.E. Scores for 1988-89 Grade Two Students

WTR			Non-WTR			Mean
N	Mean	S.D.	N	Mean	S.D.	Diff
265	40.8	20.3	202	37.8	19.7	3.0

- WTR grade two students scored higher on the MAT reading test than non-WTR students. This difference was not statistically significant.

TABLE 2

Comparison of Groups on 1989 MAT Reading
N.C.E. Scores for 1987-88 Grade One Students

WTR			Non-WTR			Mean
N	Mean	S.D.	N	Mean	S.D.	Diff
1,076	42.0	21.3	433	43.7	20.4	-1.7

- Grade one WTR students from last year continued to score lower on 1989 MAT reading test than non-WTR students. The difference is not statistically significant.

the analyses reveal that the WTR program has little immediate impact and no long-term impact on improving reading performance of participating students when compared with other reading programs.

RESULTS IN WRITING ACHIEVEMENT

Table 3 shows that WTR students, as a group, scored significantly higher on the writing posttest than their non-WTR counterparts when their pretest scores were held constant. When looking at individual grades, WTR kindergartners were the only ones that scored significantly higher than the control group. Treated independently, WTR students show advances in writing that are both statistically significant and educationally meaningful (Table 4). Pre- and posttest comparison of WTR students' handwritten sample-scores show a statistically significant mean gain of 1.6, and an educationally meaningful effect size of 1.2. All grades showed positive mean gains which were statistically significant and educationally meaningful. Not that non-WTR students also showed an overall statistically significant and educationally meaningful mean writing gain of 1.4 points (Table 5). However, analysis by grade suggests that only grade one in the control group achieved an educationally meaningful writing gain.

When bilingual and monolingual students within the WTR program are compared, monolingual students show a statistically significant higher score over bilingual students at the kindergarten level. This is a difference of moderate effect

Table 3

ANCOVA Comparison of groups on Writing Sample Posttest with Pretest as a Covariate

Grade	WTR N	WTR Adj. Mean	WTR S.D.	Non WTR N	Non WTR Adj. Mean	Non WTR S.D.	Mean Diff	eta^2
K	85	1.8	1.4	144	0.8	1.1	1.0[a]	.15
1	277	3.3	0.9	200	3.0	1.5	0.3	N/A
2	190	4.4	1.0	100	4.3	1.1	0.1	N/A
Total	552	3.3	1.3	444	2.8	1.9	0.5[a]	.02

[a]These mean differences were statistically significant at the $p \leq .05$ level.

- There was an overall statistically significant mean difference of 0.5 points.
- The only significant difference appeared in the kindergarten groups. This difference was educationally meaningful.

Table 4

Pre-Posttest Comparison of Handwritten Writing Scores for WTR Group

Grade	N	Pretest Mean	Pretest S.D.	Posttest Mean	Posttest S.D.	Difference Mean[a]	Difference S.D.	E.S.
K	85	0.1	0.4	1.8	1.4	1.7	1.6	1.1
1	277	1.2	1.3	3.3	0.9	2.1	0.3	1.6
2	190	3.4	1.1	4.4	1.0	1.0	0.9	1.1
Total	552	1.8	1.6	3.4	1.3	1.6	1.3	1.2

[a]The mean differences were statyistically significant at the $p \leq .05$ level.

- There was an overall statistically significant mean gain of 1.6 points. This mean gain was educationally meaningful.
- All grades showed positive mean gains which were statistically significant and educationally meaningful.

Table 5

Pre-Posttest Comparison of Handwritten Writing Scores for Non-WTR Group

Grade	N	Pretest Mean	Pretest S.D.	Posttest Mean	Posttest S.D.	Difference Mean[a]	Difference S.D.	E.S.
K	144	0.1	0.3	0.8	1.1	0.7	1.0	0.7
1	200	0.9	1.2	3.0	1.5	2.1	1.3	1.6
2	100	3.6	1.1	4.4	1.1	0.8	1.1	0.7
Total	444	1.2	1.6	2.6	1.9	1.4	1.4	1.0

[a]The mean differences were significant at the $p \leq .05$ level.

- There was an overall statistically significant mean gain of 1.4 points. This mean gain was educationally meaningful.
- All grades showed positive mean gains which were statistically significant.
- The mean gain for grade one represented a large effect size. Mean gains for grade kindergarten and grade two represented moderate effect sizes.

size (Table 6). The tables which follow represent the other major findings for groups of participating and non-participating students, and for the different writing products elicited from WTR students.

WTR students developed their writing skills to a greater degree than those students who did not participate in the program. Tables 7 through 10 represent frequency distributions of the writing stages in handwritten samples that students achieved by grade for both WTR students and those not participating in the program. Table 7 shows that 88 percent of the WTR students were writing sentences and producing coherent narrative discourse as compared to 60 percent of non-WTR students. No students at the kindergarten level achieved stages 5 or 6, those reflecting coherent narrative discourse and sentence complexity (Table 8). However, more WTR kindergartners showed they were capable of writing at least phrases and simple sentences of unconnected discourse (48 percent as compared to 13 percent among non-WTR participants). Less than one third of participating kindergartners were unable to produce more than their name or some unconnected letters, as compared to almost two-thirds of the non-WTR kindergartners. Table 9 shows that the same trend is apparent for first-graders: 92 percent of the WTR students as compared to 79 percent among the non-WTR students progress from writing simple sentences to connected narrative (stages 3 to 6). Only in the second grade do the data level off, with approximately the same percentages of students

Table 6

ANCOVA Comparison of Student Status (Bilingual vs Monolingual) on Writing Sample Posttest with Pretest as a Covariate for WTR Students[a]

Grade	Bilingual N	Bilingual Adj. Mean	Bilingual S.D.	Monolingual N	Monolingual Adj. Mean	Monolingual S.D.	Mean Diff	eta^2.
K	68	1.6	1.4	17	2.8	1.2	1.2[b]	.13
1	121	3.3	0.9	156	3.2	0.8	-0.1	N/A
Total	189	2.8	1.4	173	3.1	0.8	0.3[b]	.02

[a]There were no bilingual students in grade two, so an ANCOVA could not be performed for that grade.
[b]The mean differences were statistically significant at the $p \leq .05$ level.

- The mean difference between bilingual and monolingual kindergarten students was statistically significant.

TABLE 7

Group Comparison of Frequency Distribution of Writing Stages for All Grades

	WTR				Non-WTR			
	Pre		Post		Pre		Post	
Stage	N	%[a]	N	%[a]	N	%[a]	N	%[a]
8 no writing	54	--	86	--	30	--	84	--
7 non-English	--	--	8	--	27	--	45	--
6	2	0	21	4	--	-	16	3
5	16	3	85	15	27	5	67	14
4	73	12	162	28	40	7	79	17
3	151	25	233	41	63	11	136	29
2	54	9	17	3	24	4	25	5
1	58	9	19	3	50	9	37	8
0	259	42	36	6	344	63	116	24
Total	613	100	573	100	548	100	476	100

[a]Percentages and totals have been calculated to exclude samples with no writing or produced in a language other than English.

- Eighty-eight percent of WTR students produced sentences and coherent narratives (stages 3 through 6) as compared to 60 percent of non-WTR students.

TABLE 8

Group Comparison Frequency Distribution of Writing Stages for Kindergarten Students

Stage	WTR Pre N	WTR Pre %[a]	WTR Post N	WTR Post %[a]	Non-WTR Pre N	Non-WTR Pre %[a]	Non-WTR Post N	Non-WTR Post %[a]
8 no writing	18	--	21	--	7	-	21	--
7 non-English	--	--	--	--	--	-	--	--
6	--	--	--	--	--	-	--	--
5	--	--	--	--	--	-	--	--
4	--	--	3	3	--	-	--	--
3	1	1	41	45	1	-	19	13
2	--	--	6	7	--	-	12	8
1	6	6	14	15	6	4	27	18
0	88	93	28	30	157	96	92	61
Total	95	100	92	100	164	100	150	100

[a]Percentages and totals have been calculated to exclude samples with no writing or produced in a language other than English.

- Close to two-thirds of non-WTR kindergartners compared to less than one-third of WTR kindergartners produced only their names or unconnected letters (stage 0) in the post-test.
- Almost half of all WTR kindergartners produced at least phrases and simple unconnected sentences in their handwritten samples (stages 3 and 4).

TABLE 9

Group Comparison of Frequency Distribution of Writing Stages for First Grade Students

	WTR				Non-WTR			
	Pre		Post		Pre		Post	
Stage	N	%[a]	N	%[a]	N	%[a]	N	%[a]
8 no writing	21	--	53	--	10	--	49	--
7 non-English	--	--	8	--	25	--	45	15
6	--	--	--	--	--	--	6	3
5	--	--	18	6	1	0	26	12
4	3	1	81	29	4	1	40	18
3	66	20	162	57	27	10	100	46
2	41	13	10	4	19	7	13	6
1	50	16	5	2	41	15	10	5
0	162	50	6	2	184	67	22	10
Total	322	100	282	100	276	100	217	100

[a]Percentages and totals have been calculated to exclude those samples with no writing or produced in a language other than English.

- 92 percent of WTR first graders produced at least simple sentences and coherent narrative as compared to 79 percent of non-WTR first graders (stages 3 through 6).

reaching various levels of proficiency. However, there was an increase of 14 percent of WTR second graders producing at least single sentences and coherent narratives from pre to posttest as compared to an increase of nine percent for non-WTR second graders. (See Table 10.)

In comparing the different formats for producing text by WTR students, the assumption is that the word processor will allow for greater productivity, since it compensates for children's lack of fine motor coordination and their initial difficulties with controlling writing implements. As the data show, there is a significant difference overall in the opposite direction between the samples written by hand and those produced on the word processor. However, the difference is educationally meaningful only for grade two (Table 11).

TABLE 10

Group Comparison of Frequency Distribution of Writing Stages for Second Grade Students

	WTR				Non-WTR			
	Pre		Post		Pre		Post	
Stage	N	%[a]	N	%[a]	N	%[a]	N	%[a]
8 no writing	15	--	12	--	13	--	14	--
7 non-English	--	--	--	--	2	--	--	--
6	2	1	21	11	--	--	10	9
5	16	8	67	34	26	24	41	38
4	70	36	78	39	36	33	39	36
3	84	43	30	15	35	32	17	16
2	13	7	1	--	5	5	--	--
1	2	1	--	--	3	3	--	--
0	9	4	2	1	3	3	2	2
Total	196	100	199	100	108	100	109	100

[a]Percentages and totals have been calculated to exclude all samples with no writing or produced in a language other than English.

- There was an increase of 14 percent of WTR second graders producing at least simple sentences and coherent narratives from pre to posttest as compared to an increase of nine percent of non-WTR second graders.

TABLE 11

Comparison of Word Processed and Handwritten Writing Samples for Writing to Read Students

Grade	N	Word processed Mean	Word processed S.D.	Handwritten Mean	Handwritten S.D.	Mean Diff	S.D.	E.S.
K	56	0.9	1.0	1.3	1.3	-0.4[a]	1.2	0.3
1	412	3.2	0.9	3.3	0.9	-0.1	1.0	N/A
2	157	4.0	0.7	4.6	0.9	-0.6[a]	0.8	0.8
Total	625	3.2	1.2	3.4	1.3	-0.2[a]	1.0	0.2

[a]The mean differences were statistically significant at the $p \leq .05$ level.

- Overall, handwritten samples scored significantly higher than word-processed samples, but the difference was not educationally meaningful.
- The only educationally meaningful difference between the two types of samples appeared in grade two.

V. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Overall reaction to the program was positive. Most participants found that the program provided a good foundation in basic skills for students, was an excellent tool for developing confident and mature writers, and believed the computers and center setting were significant motivational devices. The program is perceived as contributing significantly to the child's psychological and social development and fostering attitudes of initiative, experimentation, and persistence that are essential to learning. Teachers who remain with the program for two or more years note significant changes in lab management, classroom instruction, and student-teacher interaction.

The program participants made successful strides in supporting and insuring the integration of WTR into the language arts curriculum both through staff development and district responsibility. Districts themselves have begun the task of integrating WTR with their other programs and enlisting various specialists in English as a Second Language, early childhood, language arts, and computer learning in the tasks of staff development and program integration. Plans to expand computer capabilities and to enlarge software libraries that promote language arts on the part of schools and districts will contribute further to establishing continuity within the

elementary school curriculum and expanding the language arts component within it.

Most paraprofessional (84 percent) and a majority of the teachers (67 percent) in new programs found that staff development was valuable. In general, positive comments were based on in-school, district-, or DCIS staff development that followed the IBM seminars. Conversely, teachers found IBM training presentations both too crammed and insufficient. For new teachers in old programs, the informal training provided was insufficient. Staff turnover and school policies that shift teachers experienced in the program to other (non-WTR) classes also contributes to limiting the benefits and outlay of training.

Additional major findings were as follows:

- WTR has little immediate impact, and no long-term impact on improving reading performance of participating students when compared with other reading programs.
- Students in the program made significant progress in their writing. Pre- and posttest comparison of handwritten samples show gains that are both statistically significant and educationally meaningful.
- In a comparison of handwritten samples, WTR students improved their writing skill to a greater degree than similar students not participating in the program. Data show that more than one quarter of all WTR students in the program exceed students not participating in the program in writing sentences and producing coherent narratives.
- Monolingual students at the kindergarten level show a statistically significant improvement over bilingual kindergartners participating in the program.
- More students in the program produce higher levels of writing in their handwritten samples than in their computer work; however, the difference is not educationally meaningful.

- The program is addressing the impact on curriculum for kindergarten through grade two and beyond. Districts and schools are initiating training and acquiring hardware and software that will enable the provision of an integrated language arts curriculum that promotes extensively student writing and writing.

RECOMMENDATIONS

Based on these findings and other information presented in this report, the following specific recommendations are made:

- Develop guidelines for school and district level roles in program administration and development.

- Program administrators and district personnel should continue to insure the maintenance of adequate supplies and the expansion of available software materials, particularly in the areas of reading readiness, reinforcement, and those materials appropriate for advanced level students.

- Continue to support the coordination of language arts curriculum development and WTR development activities.

- Encourage district and school supervisors in new programs to provide preparation time for paraprofessional and teachers to develop necessary supplementary materials, share experiences in implementing the program, and to orient themselves. First year participants also noted the significant benefits derived from the opportunities for interschool visitations established by some districts.

- Staff training should emphasize the development of positive interventions in the writing process to stimulate student creativity and reinforce phonetic instruction in the classroom to stimulate reading activity.

- Encourage schools to avoid shifting experienced teachers out of WTR to insure the stability and continuity of the program, and promote long-term positive benefits that are derived from their continued participation in the program.

APPENDIX A

WRITING SAMPLE SCORING SCALE

Stage 0 -- Letters/Child's Name

Stage 1 -- Cycle Word Writing
- -Whole word units
- -Beginning recombination
- -New words

Stage 2 -- New Word Writing
- -Phonemic understanding
- -Phonemic recombination
- -New words

Stage 3 -- Phrase/Sentence Writing
- -Unrelated phrases
- -Pictures with captions
- -Finish "sentence-starters"
- -Simple sentences

Stage 4 -- Simple Story Writing
- -Simple related sentences
- -With/without pictures
- -Assisted self-editing

Stage 5 -- Intermediate Story Writing
- -Compound/complex sentences
- -Similar to own speech
- -Developed story details
- -Assisted self-editing

Stage 6 -- Advanced Story Writing
- -Complex content
- -Length to several pages
- -Self-editing (minimal assistance)
- -Beginning standard spelling

Stage 7 -- Writing in a language other than English.

Stage 8 -- Student is present but produced no writing.